[017] Fig. 1A is a hydrodynamic torque converter with a clutch between the turbine rotor and the drive motor;

Fig. 1B and Fig 1C. are diagrammatic illustrations showing the structure and the operation of magnetic torque measurement device; and

[020] Fig. 1A:

A drive motor ~~(not shown)~~ (1M) is connected to a converter flange 1, which is itself in rotationally fixed connection with a pump impeller 2 of the hydrodynamic torque converter. When the hydrodynamic torque converter is filled with fluid and the pump impeller 2 rotates, a torque acts on the turbine rotor 3. A drive output shaft 4 is in rotationally fixed connection with the turbine rotor 3, this shaft being used as the drive input shaft of a downstream shifting transmission, preferably a power shift gearbox for working machinery such as graders or wheel loaders. A clutch 5 can be actuated in the closing direction by pressurizing a piston space 6, and then connects the drive motor (not shown) via the converter flange 1 to the turbine rotor 3. If the clutch 5 is operated in such manner as to be in slipping operation, it is not possible from knowledge of the operating condition of the drive motor alone to determine the output torque of the drive output shaft 4. For that purpose a torque measurement device 7, preferably a magnetic torque measurement device 7 as described in WO 01/96826 A2, is arranged on the drive output shaft 4. The torque measurement device 7 can also be arranged on or in the turbine rotor 3. Preferably, the torque measurement signal 10 from the said torque measurement device 7 is sent to an electronic control unit ~~(not shown)~~ 9, which generates a clutch control signal 11 that controls the clutch 5 as a function of this torque in such manner that, independently of the speed of the drive motor, there is a required torque at the drive output shaft 4 that assumes defined values in particular during a shift in the downstream power shift gearbox.

[021] Fig. 2:

A drive motor ~~(not shown)~~ 1M is in rotationally fixed connection with the converter flange 1 of a hydrodynamic torque converter. By pressurization of a piston space 6, the clutch 8 is operated in the closing direction and connects the converter flange 1 and so too the drive motor with the pump impeller 2. Rotation of the impeller 2 and filling of the hydrodynamic torque converter with fluid produces a torque on the turbine rotor 3. When the clutch 8 is slipping, the torque on the turbine rotor cannot be determined exclusively from the parameters of the drive motor or the converter flange 1, because the rotation speed of the pump impeller 2 is not known. The drive output shaft 4, which is in rotationally fixed connection with the turbine rotor 3, comprises a torque measurement device 7 which determines the torque of the turbine rotor 3. The torque measurement device 7 can also be arranged on or in the turbine rotor 3. Preferably, a magnetic torque measurement device 7 as described in WO 01/96826 A2 is used. It is also possible, however, to use torque measurement devices such as strain gauges or similar. Preferably, the torque measurement device 7 sends signals to an electronic control unit ~~(not shown)~~ 9 which, as a function of the measured torque of the drive output shaft 4 and a specified torque, actuates the clutch 8 in such manner that the measured torque corresponds to the specified torque. In particular, this makes it possible thereby to influence the shifting process and thus to improve the driving comfort of the vehicle.

[022] Figs. 1B and 1C are respectively Figs. 1 and 22 of WO 01/96826 A2 which illustrate the structure and function of the magnetic torque measurement device 7 described in WO 01/96826 A2, as do the following paragraphs incorported from WO 01/96826 A2.

[023] The magnetic transducer element 22 is formed by rotating an integral region of a shaft 20 about an axis A-A in the presence of a magnetic source 30. An annulus 42 of magnetisation results in having its magnetisation in the axial direction. The exterior magnetic field 40 emanated by the annulus 42 exhibits respective axial magnetic profiles of its axially and radially directed components

which have an axial shift under torque. The direction of profile shift depends on the rotational direction of the shaft 20 while magnetisation proceeds. A pair of regions 122a, 122b, exhibiting opposite shift directions, provide signals in which torque-dependent shift is separated from axial displacements of the shaft. An annulus 42 of magnetisation may be non-uniform with angle about the shaft axis. Measures to prevent eddy currents generated in the rotating region of the shaft under magnetisation are disclosed as are "sweet spots" 230 for sensor placement to mitigate non-uniformity effects.

[024] A significant contribution to solving the problem of axial displacement of a shaft is based on an appreciation of the fact that if two transducer regions spaced along the axis of a shaft are magnetised in the same manner but with the relative rotation of the shaft to the magnet source (usually the shaft is rotated) being in one direction for the creation of one region and in the opposition direction for the creation of the other region, then the respective magnetic profiles for the two regions shift in opposite directions for a common direction of torque applied to both. In contrast, an axial displacement of the shaft produces the same direction of shift of both profiles relative to a fixed external detector arrangement. This difference enables torque and axial displacement shifts to be separated so that a torque measurement can be compensated for axial displacement of the shaft. Furthermore a measurement of axial displacement can be obtained which is not affected by torque.

1-19. (CANCELED)

20. (CURRENTLY AMENDED) The hydrodynamic torque converter according to claim [[17]] 23, wherein the torque measurement device (7) is one of fitted directly on or in the turbine rotor.

21. (CURRENTLY AMENDED) The hydrodynamic torque converter according to claim [[17]] 23, wherein the torque measurement device (7) is [[one of]] fitted on a drive output shaft (4) which is connected with the turbine rotor.

22. (CANCELED)

23. (NEW) A hydrodynamic torque converter comprising:

a pump impeller (2) connectable to a drive motor (1M) through a continuously variable slippage clutch (8) and hydrodynamically driving a turbine rotor (3) connected with a drive output shaft (4),

a magnetic torque measurement device (7) for directly measuring an output shaft torque solely at the output shaft (4) and independently of operating conditions of the drive motor (1M) and turbine rotor (3) and generating a torque measurement signal (10) representing an actual torque imposed on the drive output shaft (4), and

an electronic control unit (9) receiving the torque measurement signal (10) and generating a clutch control output (11) controlling a slippage of the continuously variable slippage clutch (8) to control the torque imposed on the drive output shaft (4) through the torque converter to a specified value.

24. (NEW) The hydrodynamic torque converter of claim 23, wherein:

the torque measurement device (7) includes first and second magnetic transducers spaced axially apart at first and second regions along the drive output shaft (4) and generating the torque measurement signal (10) wherein the torque measurement signal (10) represents a torque induced angular shift of magnetic profiles of the first and second regions of the drive output shaft (4) that is directly proportional to the torque imposed on the drive output shaft (4).